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Combined Otoplasty Techniques in Correction of Prominent Ears

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ABSTRACT

Prominent ears are the most common congenital deformitynive0nital defor-

auricles, focusing on the following:

a- Extent of development of the antihelical fold and its superior and inferior crura.

b- Size and depth of the conchal bowl.

c- Amount of protrusion of the antitragus and ear lobe.

d- Subjective evaluation of the degree of auricular cartilage stiffness by simple finger pressure applied to recreate the antihelical fold.

e- Pre-and post-operative measurements of the distance from the mid-point of the posterior helical rim to the mastoid skin.

f- Preoperative photographic documentation consisted of frontal, posterior and right and left lateral views. The exact same views were taken 3 months postoperatively.

Operative technique:

The operation is performed under general anesthesia with the patient supine. The table is tilted head-up. No head ring is used as it is more comfortable and easier to turn the head from side to side. The face and ears are prepared with an aqueous antiseptic solution and draped with both ears exposed. Measurements of both ears are taken and the more protruding ear is operated on first. The head is turned so that the ear to be operated on is uppermost.

The ear is held against the head to determine the new antihelix which is then outlined together with its superior and inferior crura using a marking pen. Usually three or four sutures are marked: two for the antihelical fold, one for the superior crus and one for the inferior crus. The next step is to mark the skin to be resected on the posterior side of the auricle. The ear is held forward by the surgeon and a skin ellipse is marked on the posterior surface. It should be at least 1 cm medial to the helix and about 1 cm lateral to the postauricular sulcus to prevent a "glued-on-ear" appearance. The ellipse should be marked so that its upper extremity is situated close to the cephaloauricular junction.

The ear is then infiltrated using a solution of 1% Lidocaine with 1:200.000 epinephrine. Areas of infiltration included the anterior and posterior sides of the auricle into a supraperichondrial plane, the postauricular sulcus and the mastoid region. Time is allowed for the vasoconstrictive effect of the infiltrative solution, then the previously marked ellipse of postauricular skin is excised and skin undermining is continued on the back of the auricle, stopping 1 cm short of the helical rim. Any soft tissue attached to the posterior surface of the auricle is dissected out, leaving the cartilage as clean as possible to facilitate the remainder of the procedure.

The tail of the helical cartilage is identified and separated from the main body of the ear cartilage and antihelix by blunt-tipped scissors dissection and access is gained to the anterior surface. Continuing the same manoeuvre of the scissors, the skin overlying the antihelical fold is separated from the underlying cartilage, from below upwards, to the upper pole. The otoabrader is introduced through the same incision, to score the proposed new antihelical fold from above downwards in a "fan"-shaped manner until the cartilage can be folded back at the new antihelical fold, without tension, on digital pressure.

Between two and four clear 4/0 non-absorbable "horizontal-mattress-style" sutures are used to maintain the position of the new antihelical fold. The suture is passed through the full thickness of cartilage but not the anterior skin. A 4 to 6-mm bite is used which is large enough to avoid cutting through the cartilage but not so large as to cause it to buckle. These sutures must not be tied under excessive tension as this cause overcorrection. Care is taken to bury the knots in small subcutaneous pockets so that they do not protrude from the suture line.

After completing the antihelix, the degree of ear protrusion is reevaluated before any conchal setback is attempted. The setback is started by excising the intervening muscle and fascia overlying the mastoid process. For further medialization, shaving of the fossa triangularis, cavum concha and ponticulus is performed. Finally, furnas concha-mastoid sutures are used to medialize and fix the auricle to the underlying mastoid periosteum. On average, three or four ethibond sutures are sufficient; these anchoring sutures should be oriented in such a way that the conchal bowl does not rotate anteriorly, causing any encroachment on the external auditory canal.

Attention now turns to the ear lobe, which, if protuberant, requires a single suture from the dermis on the lateral side of the previously excised fusiform ellipse to the most inferior por-

tion of the concha. One suture is usually all that is needed [10].

At the completion of the procedure, the postauricular incision is closed in single layer using 4/0 chromic sutures in a running locking fashion. Measurements of the auricular projection after correction are taken and recorded. The second ear is corrected in a similar fashion.

Postoperative dressings consisted of antibiotic ointment and xeroform gauze placed over the postauricular incisions, saline-soaked cotton placed in all anterior cervices of the ears and gauze fluffs covered by circumferential kerlix and an elastic bandage held in place by a woven net dressing. Drains were not used. All patients were given intraoperative and postoperative prophylactic antibiotics. At the first postoperative day, the patient is checked for hematoma, excessive pain (particularly unilateral) and general welfare. At the second postoperative day, the dressings are removed and replaced. At 7 to 10 days postoperatively, the dressings are removed. The ears are cleansed with hydrogen peroxide and the patient is placed in a hair/head band that lightly holds the ears in place particularly during the hours of sleep. The band should be arranged to apply light, minimal pressure to the ears and to maintain them in proper position. It is advisable to have younger children wear a stockinette cap at night for 2 to 3 weeks after dressing removal to avoid accidental bending of the ears during sleep.

RESULTS

Over the past 3 years, a total of 41 prominent ears were corrected in 23 patients using the combined otoplasty techniques. There were 18 patients with bilateral prominent ears and five patients with unilateral prominent ears; the series comprised 17 males and six females, 17 children and six adults. The age range was from 7-23 years, with an average of 10 years. Patients were followed up for a minimum of 6 months and a maximum of 3 years (mean: 1.5 years). The mastoid-helix distance was between 25 mm and 31 mm before correction and 14 mm and 22 mm after correction. The mastoid-helix distance was reduced by 7 to 16 mm. There were few complications. Two patients experienced extrusion of a buried suture, which settled spontaneously and there was upper pole recurrence in two patients who were treated during the earlier part of the learning curve, when the need for adequate upper-pole scorring was overlooked. There were no infections, hematomas, skin necrosis or scar problems. Adequate symmetry was achieved in all patients, as perceived by the surgeon and the patients. No patients were dissatisfied with the final result of their operations. The lower complication rate in this series is primarily a result of the use of the combined procedures. The results of some clinical cases are seen in Figs. (1&2).

DISCUSSION

The first step in assessing the patient for otoplasty is determination of the anatomic causes of protrusion of the ear: 1- An underdeveloped or flat antihelix, 2- An overdeveloped, deep concha, 3- A combination of both these features. Contributing features that accentuate auricular protrusion are: 1- Prominence of the mastoid process, 2- Protrusion of the lower auricular pole (cauda helicis, lobule and cavum concha) 3- A prominent tipped upper auricular pole. Auricular protrusion may be one element of a more complex auricular deformity, such as a constricted ear, Stahl's ear (third crus), macrotia, cryptotia, or a syndromic facial deformity. The qualities of the auricular cartilage as a material and its biomechanical responses to external and internal forces, must be assessed not only preoperatively; but intraoperatively and indeed throughout the early postoperative period. Whether the auricular cartilage is made up of limber cartilage, stiff cartilage, floppy cartilage, or scarred cartilage is of prime importance in choosing the appropriate operative steps. The presence of auricular asymmetry or malposition, facial asymmetry, chronic otitis, diminished auditory acuity, deficient activity of facial musculature, branchial remnants, or evidence of previous operative procedures is noted to aid in identifying a syndromic pattern, a surgical contraindication, or a need for special preparations [11].

In this study, the ear is most commonly composed of limber cartilage, which is of medium thickness and resilience and responds well to manipulation by the examiner. If the examiner accentuates the roll of the antihelix with fingers, the examiner does not meet excessive resistance. However, the roll has a stabilizing pillar effect and the cartilage does not tend to shift axes, or bunch up. In this article, I will re-

Fig. (1): This 7-years-old patient had bilateral prominent ear deformities consisting of a lack of antihelical folds, conchal excess and lobular protrusion. Correction was achieved with the mustrade, furnas, stenstrom and spira techniques:


Anterior views:
(A) Preoperative
(B) 3 months postoperative.


Posterior views:
(C) Preoperative
(D) 3 months postoperative.


Right lateral views:
(E) Preoperative
(F) 3 months postoperative.


Left lateral views:
(G) Preoperative
(H) 3 months postoperative.

Fig. (2): This 23-years-old patient had bilateral prominent ear deformities consisting of a lack of antihelical folds and conchal excess. Correction was achieved with the mustrade, furnas and stenstrom techniques:

Anterior views:
(A) Preoperative
(B) 3 months postoperative.

Posterior views:
(C) Preoperative
(D) 3 months postoperative.

Right lateral views:
(E) Preoperative
(F) 3 months postoperative.

Left lateral views:
(G) Preoperative
(H) 3 months postoperative.

fer only to prominent ears and only those caused by the lack of formation of the antihelix and/or excessively large auricular concha.

The auricle is complex structure of fibroelastic cartilage without subdermal connective tissue. The anteriorly overlying skin is very thin and it is firmly attached to the perichondrium; the skin at the posterior aspect is thicker and it lies on a thin layer of connective tissue. The auricle exhibits several prominences, grooves and folds. As surgeons, we are committed to the creation of a new auricle that is as similar to a normal one as possible. In unilateral cases, the challenge may be greater, since the goal is to try to imitate as perfectly as possible the normal side, both in size and in the auriculomastoid angle, as well as the prominences, grooves and folds. With this goal in mind, facial surgeons who perform otoplasties with remodelling of the antihelix must try their best to achieve (1) symmetry; (2) an adequate auriculomastoid separation (≥ 12 mm) from the surface of the mastoid process to the lateral border of the helix; (3) anatomical remodelling of the antihelix without acute angles or edges; (4) invisible scars; (5) lasting results; (6) preservation of the

There has been increasing criticism of cartilage-cutting techniques because of unacceptably high complication rates, especially in training-grade surgeons and secondary sharp ridging and contour irregularities [38,39]. In this study, cartilage molding techniques were prefered over cartilage-breaking techniques.

As a consequence, it had been suggested that there had been an increasing popularity of cartilage-sparing techniques in which the auricle is medialized by sutures, of these, the mustarde or furnas concha-mastoid sutures are the most commonly described. Mustarde [40] created conical antihelical tubing with permanent conchoscaphal mattress sutures of white braided silk. These sutures, which were found to be particularly successful in treating the pliable cartilage of children were placed full-thickness through the cartilage of the concha and scapha in mattress fashion without piercing the lateral skin through a posterior approach. All cartilage tubing techniques depend on scarring to fill the tube and lock the sculpted framework into position. Mustarde [41] had emphasized that a critical point in the success of the suture technique is the removal of all soft tissue from the posterior surface of the auricular cartilage in the area to be folded. Conchal setback is started by excising the intervening muscle and fascia overlying the mastoid process. For further medialization, shaving of the cartilaginous prominences on the medial surface of the fossa triangluaris, cavum concha and ponticulus is performed. Finally, furnas concha-mastoid sutures are used to medialize and fix the auricle to the underlying mastoid periosteum [42]. However, postauricular suture extrusion may result, or there may be pain from non-absorbable sutures prickling the dermis from beneath [43]. Furthermore, recurrence rates of up to 24% had been recorded [44]. Horlock et al. [39] had combined the postauricular facial flap with mustarde and furnas concha mastoid sutures to prevent suture extrusion.

Attwood and Evans [45] stated that there is an inherent difficulty in folding cartilage in a curve without prior weakening of the cartilage.

Several authors had described posterior weakening of the cartilage by: gauging of the posterior antihelix to simulate rows of cartilage scales without damaging the anterior surface [46], using a wire brush [47], using shallow parallel curvilinear incisions along the posterior cartilage (antihelix groove) without penetrating the anterior perichondrium [23], using dermabrasion tool with a 6 mm-diameter spherical metal head to make a curved canal [48], using the endoscope [49] or using electrocautery [50].

Closed anterior scoring of the antihelical fold through a posterior approach had been described by Stenstrom [51] and modified by Yugueros and Friedland [52] and Thomas and Fatah [53]. This technique was prepered as it is based on various techniques that had been described for altering the shape of cartilage in surgical procedures. Gibson and Davis [54], using rib cartilage and Fry [55], using nasal septal cartilage, had demonstrated that cartilage bends in a direction opposite a cut surface and in proportion to the amount of cartilage removed from that surface. The authors had postulated that this effect had occurred because of an osmotic effect within the injured cartilage matrix. Stenstrom [51] had made similar observations in ear cartilage and had speculated that elastin fiber disruption had played a role in the changes observed in addition to perichondrial stripping. Based on these principles, the stenstrom otoplasty exploits the intrinsic mechanical properties of cartilage to produce an antihelical fold. More recent experimental work had confirmed these findings [56,57].

Many procedures had been developed in an attempt to minimize scars but they involve using needles and incisions on the anterior surface. Using hypodermic needles after manually bending the tip does not give the surgeon a "feel" for where exactly the needles lies in relation to the cartilage thickness. Hence, it is easy to go through the whole thickness of the cartilage and fracture it [58,59]. Incisions on the anterior surface increase the risk of hypertrophic scarring and keloid formation on the visible part of the ear [60-62]. Even, endoscopic pinnaplasty had been tried but had been found to be technically difficult and time consuming [49]. Erol [63] had used the anterior approach to treat 55 patients with prominent ear deformity. Elliott [13] was the first to describe a combined approach for otoplasty.

In a review of 167 patients, who underwent stenstrom otoplasty, Heftner [64] had found that although 89% of the patients declared themselves satisfied, 25% were noted to be overcorrected and 14% were noted to have sharp cartilage irregularities along the antihelix. In a series of 292 patients, Baker and Converse [65] had

noted the following complications: hematoma, 0.8%; localized cellulitis, 1.2%; chondritis, 0.7%; hypertrophic scars, 0.7%; telephone deformity 3%; recurrence after mustarde technique 4.3%; keloids occurred in 11% of black patients (one bilateral) and 2.1% of caucasian patients. A personal review by Mustarde [66] of 600 ears treated over 20 years had revealed only six patients in whom sinus tracts to silk sutures developed and only 10 ears that required reoperation for residual deformity. A retrospective review by Tan [67] comparing the mustarde technique with the stenstrom technique had illuminated some potential pitfalls. Tan had found that although there was more than a 90% final acceptance by patients of superior or better results with either method, 24% of patients treated by the mustarde technique had required reoperation, where as 10% of patients treated by the stenstrom had required reoperation. Complications specific to the mustarde technique in this series were the presence of sutures resulting in sinuses and wound infection in 15% of cases. Calder and Nassan [68] found a complication rate of 16.6% in a review of more than 500 cases. Messner and Crysdale [69], observing patients treated using the mustarde technique for at least one year after surgery, found that in up to 40% of ears, the final position had returned to within 3 mm of the preoperative state. The incidence of hypertrophic/keloid scars following prominent ears correction is between 0 and 3.5% (an average of 1.2%) [48].

In our series, there was suture extrusion in 2 patients (8.7%) that were treated by being removed in an outpatient setting in the office without any secondary complications. None of these patients required additional surgery because of any loss of initial correction after suture extrusion and removal, undoubtedly because of the combination of the various techniques, which ensures a long and lasting correction. There was upper-pole recurrence in another two patients (8.7%) who were treated during the early part of the learning curve, when the need for adequate upper-pole scoring was overlooked. There were no cases of hematomas, infections, skin necrosis or hypertrophic scars or keloids. There were no anterior scars or posterior cartilage overlaps.

The advantage of our procedure is that it is versatile and applicable to both children and adults. Though it is technically easier to perform in children, with more pliable cartilage, it can be performed in adults, with more resilient cartilage. If the correction is deficient in any way, such as a protruding ear lobule, then this can very easily be corrected during the initial procedure. The option of reverting to an open procedure is always there if one encounters a very resilient cartilage that is refractory to closed scoring. In our series, however, the need for this never arose.

Our procedure is also technically easy, safe and less time consuming. For trainee surgeons, the procedure is less likely to produce unacceptable results in the early stages because it has a rapid learning curve. It gives a more natural appearance with fewer complications and should always be kept in mind when assessing a patient with prominent ears.

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